

CLAIMS

1. A transmission comprising:
 - at least one planetary gear set having first, second and third members;
 - a clutch pack connected to one of said members;
 - 5 a rotatable housing member connected to another one of said members;
 - a piston assembly supported on said rotatable housing member and rotatable therewith; said piston assembly including a thrust bearing operatively connected with an axially movable piston to receive an apply
 - 10 force from the piston, and a piston apply member positioned between said thrust bearing and said clutch pack for transmitting the apply force to the clutch pack; and
 - wherein fluid for applying said piston is carried through a stationary support member, through said rotatable housing member, and into
 - 15 the piston assembly.
2. The transmission of claim 1, wherein said piston apply member is rotatable, and is not rotatably connected to said piston.
3. The transmission of claim 1, wherein said thrust bearing comprises a needle bearing.
4. The transmission of claim 1, wherein said first, second and third members comprise a ring gear, a planet carrier assembly member, and a sun gear, respectively; said one of said members connected to the clutch pack is the ring gear, and said another one of said members connected to the
- 5 rotatable housing member is the planet carrier assembly member; and said

rotatable housing member is a rotatable carrier housing member connected to said planet carrier assembly member.

5. The transmission of claim 4, wherein said sun gear is non-rotatably supported on said stationary support member, which is a stationary sun gear carrier, and said piston assembly is supported on said carrier housing member and rotatable therewith.

6. The transmission of claim 5, wherein said piston cooperates with a first piston member to form an apply chamber therebetween.

7. The transmission of claim 6, wherein said thrust bearing is positioned between the piston and the piston apply member so that the piston apply member and clutch pack may rotate at a different speed than the planet carrier assembly member.

8. The transmission of claim 5, wherein oil for applying said piston is fed through said stationary sun gear carrier and through said carrier housing member to said piston.

9. A multi-speed transmission comprising:

an input shaft;

an output shaft;

a planetary gear arrangement having first, second and third

5 planetary gear sets, each planetary gear set having first, second and third members;

said input shaft being continuously interconnected with said first member of said first planetary gear set, and said output shaft being continuously interconnected with said first member of said third planetary

10 gear set;

said first member of said second planetary gear set being integrally connected with said first member of said third planetary gear set; and said third member of said first planetary gear set being continuously connected with a transmission housing;

15 an interconnecting member continuously interconnecting said second member of said second planetary gear set with said second member of said third planetary gear set;

 a first torque-transmitting mechanism selectively interconnecting said second member of said first planetary gear set with said third member of
20 said third planetary gear set;

 a second torque-transmitting mechanism selectively interconnecting said first member of said first planetary gear set with said third member of said third planetary gear set;

 a third torque-transmitting mechanism selectively interconnecting
25 said third member of said second planetary gear set with said transmission housing;

 a fourth torque-transmitting mechanism selectively interconnecting said second member of said first planetary gear set with said third member of said second planetary gear set;

30 a fifth torque-transmitting mechanism selectively interconnecting said first member of said first planetary gear set with said second member of said third planetary gear set;

 a sixth torque-transmitting mechanism selectively interconnecting
35 said second member of said second planetary gear set with said transmission housing;

 a clutch pack connected to one of said members of said first planetary gear set; a rotatable housing member connected to another one of said members of said first planetary gear set; a piston assembly supported on said rotatable housing member and rotatable therewith; said piston assembly
40 including a thrust bearing operatively connected with a piston to receive an

apply force from the piston, and a piston apply member positioned between said thrust bearing and said clutch pack for transmitting the apply force to the clutch pack; wherein fluid for applying said piston is carried through a stationary support member, through said rotatable housing member, and into
45 the piston assembly; and

said first, second, third, fourth, fifth and sixth torque-transmitting mechanisms being engaged in combinations of two to establish seven forward speed ratios and a reverse speed ratio between said input shaft and said output shaft.

10. The transmission of claim 9, wherein said first member of said second planetary gear set and said first member of said third planetary gear set comprise a single elongated ring gear.

11. The transmission of claim 9, wherein said first and second planetary gear sets are simple planetary gear sets, and said third planetary gear set is a compound planetary gear set.

12. The transmission of claim 9, wherein each of said first members is a ring gear, each of said second members is a planet carrier assembly member, and each of said third members is a sun gear.

13. The transmission housing of claim 9, wherein said first, second, fourth and fifth torque-transmitting mechanisms comprise rotating clutches, and said third and sixth torque-transmitting mechanisms comprise brakes.

14. The transmission of claim 9, wherein said first member of said second planetary gear set and said first member of said third planetary gear set comprise ring gears which are integrally connected by being splined to a common sleeve.

15. The transmission of claim 9, wherein said second torque-transmitting mechanism is positioned at a location which is not between said first, second and third planetary gear sets.

16. The transmission of claim 9, wherein said first, second and third members comprise a ring gear, a planet carrier assembly member, and a sun gear, respectively, and said one of said members connected to the clutch pack is the ring gear of the first planetary gear set, and said another
5 one of said members connected to the rotatable housing member is the planet carrier assembly member of the first planetary gear set.

17. The transmission of claim 16, wherein said sun gear of said first planetary gear set is non-rotatably supported on said stationary support member, which is a stationary sun gear carrier; said rotatable housing member is a carrier housing member connected to said planet carrier
5 assembly member of said first planetary gear set; and said piston is supported on said carrier housing member and rotatable therewith.

18. The transmission of claim 17, wherein said piston cooperates with a first piston member to form an apply chamber therebetween.

19. The transmission of claim 18, wherein said thrust bearing is positioned between the piston and the piston apply member so that the piston apply member and clutch pack may rotate at a different speed than the planet carrier assembly member of the first planetary gear set.

20. The transmission of claim 17, wherein oil for applying said piston is fed through said stationary sun gear carrier and through said carrier housing member to said piston.

21. A multi-speed transmission comprising:

an input shaft;

an output shaft;

a planetary gear arrangement having first, second and third

5 planetary gear sets, each planetary gear set having a ring gear, a planet carrier assembly member, and a sun gear;

said input shaft being continuously interconnected with said ring gear of said first planetary gear set, and said output shaft being continuously interconnected with said ring gear of said third planetary gear set;

10 said ring gear of said second planetary gear set being integrally connected with said ring gear of said third planetary gear set; and said sun gear of said first planetary gear set being continuously connected with a transmission housing;

an interconnecting member continuously interconnecting said
15 planet carrier assembly member of said second planetary gear set with said planet carrier assembly member of said third planetary gear set;

a clutch pack connected to one of said members of said first planetary gear set; a rotatable housing member connected to another one of said members of said first planetary gear set; a piston supported on said
20 rotatable housing member and rotatable therewith; a thrust bearing operatively connected with the piston to receive an apply force from the piston; and a piston apply member positioned between said thrust bearing and said clutch pack for transmitting the apply force to the clutch pack;
wherein fluid for applying said piston is carried through a stationary support
25 member, through said rotatable housing member to the piston; and

six torque-transmitting mechanisms selectively engaging said members of said planetary gear sets with other members or with said transmission housing, said six torque-transmitting mechanisms being engaged in combinations of two to establish seven forward speed ratios and a reverse speed ratio between said input shaft and said output shaft.

22. The transmission of claim 21, wherein said first, second and third members comprise a ring gear, a planet carrier assembly member, and a sun gear, respectively, and said one of said members connected to the clutch pack is the ring gear of the first planetary gear set, and said another one of said members connected to the rotatable housing member is the planet carrier assembly member of the first planetary gear set.

23. The transmission of claim 22, wherein said sun gear of the first planetary gear set is non-rotatably supported on said stationary support member, which is a stationary sun gear carrier; and said rotatable housing member is a carrier housing member connected to said planet carrier assembly member of the first planetary gear set.

24. The transmission of claim 23, wherein said piston cooperates with a first piston member to form an apply chamber therebetween.

25. The transmission of claim 24, wherein said thrust bearing is positioned between the piston and the piston apply member so that the piston apply member and clutch pack may rotate at a different speed than the planet carrier assembly member of the first planetary gear set.

26. The transmission of claim 23, wherein oil for applying said piston is fed through said stationary sun gear carrier and through said carrier housing member to said piston.

27. A multi-speed transmission comprising:

an input shaft;

an output shaft;

a planetary gear arrangement having first, second and third

5 planetary gear sets, each planetary gear set having a ring gear, a planet carrier assembly member, and a sun gear;

wherein said second planetary gear set is a simple planetary gear set, and said third planetary gear set is a compound planetary gear set;

10 said input shaft being continuously interconnected with said ring gear of said first planetary gear set, and said output shaft being continuously interconnected with said ring gear of said third planetary gear set;

15 said ring gear of said second planetary gear set being integrally connected with said ring gear of said third planetary gear set; and said sun gear of said first planetary gear set being continuously connected with a transmission housing;

20 wherein said ring gear of said second planetary gear set and said ring gear of said third planetary gear set are integrally connected by being both splined to a sleeve, and a spacer and spring member are positioned between said ring gear of said second planetary gear set and said ring gear of said third planetary gear set;

an interconnecting member continuously interconnecting said planet carrier assembly member of said second planetary gear set with said planet carrier assembly member of said third planetary gear set;

25 a first torque-transmitting mechanism selectively interconnecting said planet carrier assembly member of said first planetary gear set with said sun gear of said third planetary gear set;

a second torque-transmitting mechanism selectively interconnecting said ring gear of said first planetary gear set with said sun

gear of said third planetary gear set, wherein said second torque-transmitting
30 mechanism is positioned between said first and second planetary gear sets;
a third torque-transmitting mechanism selectively interconnecting
said sun gear of said second planetary gear set with said transmission
housing;
a fourth torque-transmitting mechanism selectively
35 interconnecting said planet carrier assembly member of said first planetary
gear set with said sun gear of said second planetary gear set;
a fifth torque-transmitting mechanism selectively interconnecting
said ring gear of said first planetary gear set with said planet carrier
assembly member of said third planetary gear set;
40 a sixth torque-transmitting mechanism selectively interconnecting
said planet carrier assembly member of said second planetary gear set with
said transmission housing;
a clutch pack connected to said ring gear of said first planetary
gear set; a rotatable carrier housing member fixed to said planet carrier
45 assembly member of said first planetary gear set; a piston supported on said
rotatable carrier housing member and rotatable therewith; a thrust bearing
operatively connected with the piston to receive an apply force from the
piston; and a piston apply member positioned between said thrust bearing
and said clutch pack for transmitting the apply force to the clutch pack;
50 wherein fluid for applying said piston is carried through a stationary support
member which supports said sun gear of said first planetary gear set, through
said rotatable carrier housing member, and to the piston; and
said first, second, third, fourth, fifth and sixth torque-transmitting
mechanisms being engaged in combinations of two to establish seven
55 forward speed ratios and a reverse speed ratio between said input shaft and
said output shaft.